

UC Berkeley

UC Berkeley Previously Published Works

Title

Between Scylla and Charybdis: Environmental governance and illegibility in the American West

Permalink

<https://escholarship.org/uc/item/7060p5v7>

Author

Martin, Jeff V

Publication Date

2020-04-16

DOI

10.1016/j.geoforum.2019.08.015

Peer reviewed

Between Scylla and Charybdis:

Environmental governance and illegibility in the American West (*post-print*)

Martin, Jeff Vance. In press. "Between Scylla and Charybdis: Environmental governance and illegibility in the American West." *Geoforum*. <https://doi.org/10.1016/j.geoforum.2019.08.015>.

Abstract

In *The Odyssey*, Odysseus and his crew must navigate the Strait of Messina between two great hazards: the six-headed monster Scylla on one side, and the whirlpool Charybdis on the other. This conceit here guides a critical engagement with scientific knowledge and state power, grounded in the positionality and practices of government agents charged with the management of controversial species and processes in the American West. Based in ethnographic and archival research on wolf-livestock conflict and public lands grazing in Central Idaho, I relate how agents with the U.S. Forest Service and Idaho Department of Fish and Game navigate conditions not of their own choosing. Sailing the "choppy seas" of complex systems and multiple-use mandates, with the "whirlpool" of cuts to capacity on one side and the "monster" of political controversy and litigation on the other, agents appear to collect less or more ambiguous information on their charges, resulting in a partial "blindness" or *illegibility*. Although a rational adaptation to unrealistic expectations, this ignorance is not bliss but rather symptom and source of dysfunction, limiting agents' ability to carry out monitoring, collaboration, and effectively conduct on-the-ground management. Understanding patterns of illegibility requires that we attend both to broader contextual pressures and situated motivations. In so doing, we might account for the seeming disconnect between agencies' stated aims and practices, complicate traditional assumptions of evidence-based scientific management and analyses of bureaucratic rationality and state power, and make sense of the apparent dysfunction around environmental governance in the American West today.

Keywords

Agnotology; environmental governance; land management; legibility; strategic ignorance; wildlife management

Acknowledgements

Thanks to Deborah Bieber, Jennie Durant, Adam Jadhav, Jake Kosek, Rebecca Lave, Nancy Peluso, Nathan Sayre, Jennifer Sedell, and Danielle Watts, who each helped inspire and refine the arguments herein; to the organizers of our special issue, Brian King and Nari Senanayake; to the anonymous reviewer who encouraged me to more fully develop these theoretical engagements; to my endlessly supportive partner Katrina Storey; and to the hard-working agents of the U.S. Forest Service and Idaho Department of Fish and Game who took the time to speak with me.

1. Governing on contentious terrain

In *The Odyssey*, Homer describes an episode in which Odysseus and his crew must navigate the Strait of Messina between two great hazards: the six-headed monster Scylla on one side, and the whirlpool Charybdis on the other. I use this metaphor to conceptualize the positionality and choices made by government agents charged with the management of species and environments in the American West amid public controversy and declining capacities.

Environmental governance in the U.S. takes place across a “checkerboard” of land ownership and use patterns and at times overlapping and conflicting agency responsibilities (see Fig. 1, Section 1) – a longstanding instance of the now “increasingly common imbrication of multiple types and scales of authority over given territories” (McCarthy, 2007, 190). Public lands make up more than half of the 11 contiguous western states, much of it managed by the U.S. Forest Service (USFS) and Bureau of Land Management (BLM). Governance of resources and wildlife on these lands, then, make federal and state agencies central – and contentious – players in the region.

Idaho provides an important arena for considering environmental governance: the state is nearly two-thirds public land¹ – much of it managed as “multiple use” working landscapes – and it was one of two reintroduction sites for the gray wolf (*Canis lupus*) in the mid-1990s.² Based on research conducted in and around Central Idaho between 2015 and 2017, I focus here on the experience and practices of midlevel career employees of the U.S. Forest Service and Idaho Department of Fish and Game (IDFG), with their respective responsibilities around rangeland livestock grazing (an longstanding but increasingly controversial resource use),³ and the management of the state’s wolf population during and after the transition from federal to state management (as endangered species protections have been removed, and as wolves are seen to pose a threat to rural livelihoods). Management of lands, resources, and species amid competing users, claims, and priorities puts agents in the middle of environmental controversy and regional politics, especially as the Idaho and surrounding states continue to transition from extractive industry dominance to so-called “New West” patterns of rural gentrification and recreation (Walker, 2003; Hines, 2010, 2011; Bryson and Wyckoff, 2010; Ghose, 2013).

Figure 1. Management and concerns around land and species in Idaho

Nature	Manager	Concerns
Land (resource, range, habitat)	US Forest Service (USFS) + Bureau of Land Management (BLM)	Ecosystem health, resource extraction (timber, livestock grazing), recreation
Livestock (sheep, cattle)	Land Agency (USFS or BLM) + Private Operators	Range quality, wildlife impacts, depredation, environmentalist opposition
Wildlife (species of concern, e.g. wolves)	State Fish & Wildlife Agency (IDFG) + US Fish & Wildlife Service (USFWS)* *(when under ESA protection)	Population viability, predation on game and livestock, public interest

¹ Idaho holds the highest percentage of state land under national forest as well as the largest contiguous federally managed wilderness outside of Alaska (Our Public Lands, N.D.; USFS, 2012; USFS, N.D.).

² Wolves were reintroduced through federal action to Yellowstone National Park and Central Idaho in 1995 and ’96 (see Fischer, 1995).

³ Privately-owned livestock have long grazed on the public domain, and since the establishment of the Forest Service have done so through a system of leased allotments (see Rowley, 1985; Sayre, 2017).

Resource and wildlife management has historically leaned on measurement and monitoring, with quantitative data on numbers, presence, and trends central to analysis and policy making (Porter, 1995). New technologies of surveillance and data science seemingly allow for ever-greater capacities to make landscapes and species “legible” and thereby governable (Scott, 1998; Arts et al., 2015; Adams, 2017). Yet on-the-ground decisions around what is done and how do not follow traditional assumptions of evidence-based scientific management. Through implicit and pragmatic choices around day-to-day practices, technologies employed, and where time and attention get spent, agents appear to collect less or more ambiguous information on their charges, resulting in a lack of knowledge and subsequent problems for on-the-ground management. This partial blindness, in contrast to Scott (1998), I term *illegibility*: understood as the simultaneous production of particular forms of knowledge alongside “nonknowledge” or ignorance.

I thus build on work by Li (2005) and others in a constructive critique of legibility and state power, bringing together insights from political ecology, science and technology studies, and an emerging “sociology of nonknowledge” to help think through agents’ decision-making. Following Dillon et al. (2019), I position these arguments in the context of pressing contemporary concerns: the current administration’s increasingly anti-environmental stance and dismissal of evidence-based claims, capital’s capture of regulatory agencies along with the slashing of regulations and efforts to defund and dismantle scientific work, and amid a longstanding trend of neoliberalization. Squeezed between budget cuts on one side and political pressure and litigation on the other, agents pursue a sort of “satisficing” strategy to avoid reaction in the face of unrealistic demands (cf. Simon, 1956; Smith and Martin, 1972). Through these insights I hope to help account for the seeming disconnect between agencies’ stated aims and practices, and make sense of the apparent dysfunction around environmental governance in the American West today.

In what follows, I first review the literatures on state power and scientific practice, bringing into conversation a broadly construed political ecology with an emerging literature on uncertainty and ignorance. I then examine the practices of USFS and IDFG agents around rangelands and wolves through the conceit of *The Odyssey*’s Scylla and Charybdis. Agents attempt to carry out their responsibilities (keeping the “ship of state” sailing (cf. Plato 360)) amid the “choppy seas” of socio-ecological complexity, the “whirlpool” of declining capacities, and the “monster” of political controversy. I then show how agency practices manifest forms of illegibility, a seemingly paradoxical outcome produced by broader contextual pressures and situated motivations. I close with some of the implications this analysis holds for our understanding of the relationship between scientific knowledge and power and in our current political moment.

2. Governance and non/knowledge

In *Seeing like a State* (1998), James Scott argues that the increased capacities of the modern state were bound up with efforts to classify and measure, overcoming a pre-modern “partially blind” relationship to territory and subjects. Drawing on Foucault and Weber, Scott is interested in how environments and populations are made *legible* and thereby governable. Diverse technologies of surveillance and planning – such as the cadastral survey and scientific forestry – measure, classify, and standardize nature and society in ways that simplify and benefit state functions. This scientific-managerial project of “rendering technical,” then, connects particular sorts of knowledge with state power (Ferguson, 1994; Mitchell, 2002; Li, 2007; Morgan and Orloff, 2017).

Geographers, anthropologists, and other critical scholars have taken up Scott's insights as "starting point and provocation" for thinking in more nuanced ways about knowledge production and "how power works" (Li, 2005, 383). This scholarship fits alongside a "new sociology of the state" that moves to de-fetishize "the" state as unitary and reified actor, instead approaching it as historically-produced, emergent effect, social relation, and process (Mitchell, 1991; McCarthy, 2007; Morgan and Orloff, 2017; Loftus, 2018). Within political ecology, work like Peluso's (1992) has emphasized Marxian political economic questions of resource access and use, and how state power over land and resources is exercised, justified, and contested. Others have gone back to Foucault, rethinking government itself a field of power and emphasizing the depoliticizing effects of bureaucratic and technocratic interventions (Li, 2005, 2007; cf. Ferguson, 1994). Efforts to link political ecology and science and technology studies (STS) (Braun and Castree, 1998; Forsyth, 2003; Goldman et al., 2011; Lave, 2012), as well as the recent emergence of critical physical geography (Lave et al., 2018), have looked at the construction, use, and transmission of "expert" scientific knowledges, linked the practice of science to its broader social context, and highlighted contestation over what count as valid and valued understandings of the world.

Recent scholarship, largely from sociology and STS, explores the production and use of various forms of ignorance and "nonknowledge" across scientific, regulatory, and corporate contexts (Proctor and Schiebinger, 2008; Kleinman and Suryanarayanan, 2012; McGoey, 2012a), further complicating the linkage between knowledge and social power. Knowledge and ignorance are reconceptualized not as opposites but rather as "poles of a continuum" (Heimer, 2012, 19), with partial, inexact, uncertain, uneven, and provisional knowledges (cf. Böschén et al., 2010, 785).⁴ Kleinman and Suryanarayanan (2012) explore the relationship of these forms to regulatory and scientific cultures, which produce knowledge gaps – what Murphy (2006) calls "regimes of perceptibility" – along a spectrum of intentionality (cf. Sedell, in press). Persistent and intrinsic forms – *uncertainty* and *indeterminacy* – are pervasive across scientific and policy spheres (Brown and Damery 2009; Böschén et al., 2010). These are particularly notable in ecology, where complexity and relationality "resist" simple understandings and reconfigurings – such insights, indeed, build on the same issues flagged by Scott around the gap between top-down state knowledge and a complex reality "intractib[le] to government" (Li, 2007, 18). But nonknowledge can also be *produced*, as seen in the literature on agnotology (Murphy, 2006; Pred, 2007; Proctor and Schiebinger, 2008). This "strategic ignorance" – a blindness that serves as complement and contrast to the limited vision of Scott's legibility – holds *utility* for certain actors, as disinformation, misrepresentation, and strategic omissions are fostered and deployed with great political effect (McGoey, 2007, 2012a, 2012b; cf. Pred, 2007; Oreskes and Conway, 2010).

These lineages can be productively (and geographically) grounded in the western United States (cf. Martin et al., 2019). By the classic view of "centralization, coherence, and autonomy... as intrinsic features of 'strong' states," the U.S. is a notable outlier: historically, it has been both powerful and decentralized (Morgan and Orloff, 2017, 6, 14). In the West especially, power is often seen as dispersed, fragmented, and contested given the multi-layered, multi-agency, "patchwork" quality of governance. Here the relationship between environmental governance (and exploitation) and the production of the national state are closely tied. In recent history, such dynamics are further complicated by the interplay of neoliberalization (including reduced funding and staffing of federal

⁴ McGoey notes the challenges of taxonomizing the unknown (2012a, 7), and indeed the boundaries of her own earlier typology of ignorance (2007, 229) appear uncertain.

agencies), and regional contestation (in the form of libertarian, anti-regulatory, and anti-federal attitudes).

2.1. Methods

The following is based on fieldwork conducted in Central Idaho and the surrounding region between 2015 and 2017. Arguments draw on ethnographic investigation, archival research, and document review, focusing here on the practices of IDFG and USFS agents from roughly the mid-1990s to the present, across large swathes of national forest land in Central Idaho managed as both livestock grazing lands and wolf habitat. I conducted over 40 semi-structured interviews with individuals from federal, state, and local government agencies, livestock producers, and environmental organizations, as well as participant observation in meetings, workshops, and range tours. Interviews were conducted with individuals across different levels and job foci – including five IDFG agents, five USFS agents across a handful of central Idaho districts, as well as 10 government employees across other related departments – and focused on mid-level career employees with programmatic responsibilities (not, notably, in charge of budgets or larger policy directions). All had training as biologists, ecologists, or range specialists, and had often worked in one or more agencies for many years. Archival research at the Idaho State Archives (Boise) and the Regional History Department of the Community Library (Ketchum) included oral histories from regional livestock producers, forest rangers, and game agents, and was supplemented by a review of scientific and agency literatures, including annual wolf management reports.

3. Navigating the ship of state

As social beings, state agents are embedded in conditions not of their choosing, yet also contribute to the production of socio-ecological reality through their practices (cf. Marx, 1852; Latour, 2005). In approaching the work of USFS and IDFG from a political ecological perspective, I emphasize how agents seek to manage the natures under their care while navigating the seas of socio-ecological complexity amid the threats of declining capacities and public contestation. I thus build and elaborate on previous scholarship (see Section 2), while highlighting how changing conditions necessitate we complicate our arguments surrounding knowledge and power, state and science.

As noted above, environmental governance in the West takes place amid a complex terrain of multiple agencies and at times overlapping and even conflicting responsibilities (see Fig. 1). For purposes of the agencies and debates of concern here, key players include USFS and IDFG agents; ranchers and their livestock; and conservation nonprofits, also known as environmental nongovernmental organizations (ENGOS). In many cases, the latter two groups roughly align with anti- and pro-wolf camps; environmentalists promote wolf return, while ranchers fear the real and perceived threats they pose.⁵

The growth of the U.S. environmental movement in the 1970s resulted in several pieces of landmark legislation (see Fig. 2), which collectively created a new regulatory landscape: establishing new sets of concerns and requirements governing how federal agencies made decisions affecting the environment, and authorizing citizens and nonprofit organizations to bring suit against the government to enforce these laws (MacCleery, 2008; Fogleman, 2017). For agencies charged with

⁵ However, some ranchers and environmental organizations pursue coexistence between wolves and livestock on public lands through collaboration and the use of non-lethal management tools (see Stone et al., 2017).

managing livestock grazing on public lands, NEPA and FLPMA have been particularly central, requiring a new system of environmental review. Since the advent of the environmental movement and especially since the 1990s, there has also been a growing campaign by several ENGOs to eliminate grazing from public lands: citing negative impacts on ecosystems and species, while fitting with desires by recreationists to minimize evidence of extractive uses on landscapes of recreation and consumption (cf. Neumann, 1998; Brugger et al., 2020).

Once common throughout North America, gray wolves had been virtually extirpated from the lower 48 states by the early 20th century. Per section 10(j) of the ESA, wolves were released into Central Idaho and Yellowstone National Park in 1995 and '96 as an “experimental, non-essential” population, part of a federal effort to return them to a portion of their former range and further reflecting the broader environmental policy shift since in the 1970s. From the wolves initially released (35 in Idaho: 15 in 1995, 20 in 1996), the population grew steadily in numbers and range, meeting recovery targets in 2000 and initiating the process of ESA delisting and devolution of management to the states.⁶

Although removal from the endangered species list (“delisting”) is the stated goal of the ESA, it is a rarity and remains controversial. For wolves, the removal of federal protection meant increasingly flexible and frequent use of lethal control for “problem wolves” and the introduction of hunting seasons; a problem for pro-wolf forces who wanted to avoid a repetition of extermination, but a boon to those who saw rising wolf numbers as a threat to livestock production and game hunting. Following a decade of legal back-and-forth, wolf delisting passed in 2011 via federal budget bill rider.⁷ This initiated a mandatory minimum 5-year federal oversight period, during which IDFG was tasked with documenting and maintaining the wolf population within state boundaries.

Conservation is frequently understood as a “biopolitical regime”: through the demarcation and control of space, the making live and letting die of species, and the detection and regulation of biophysical process, managers deploy technologies of monitoring and control in ways that fit well with a Foucauldian view of legibility and biopolitics (Lorimer, 2015; Adams, 2017; cf. Scott, 1998; Agamben, 1998; Foucault, 2007, 2008). Yet even as tools for environmental remote sensing and the tracking and surveillance of wildlife have seen dramatic advances (Arts et al., 2015; Adams, 2017, 2-4), environmental governance itself has not grown in vision and power. Instead, we must think through management practices, including technological choices and tools deployed, as *situated social practice*. By tracing the practices and discourse of IDFG and USFS agents around wolf and range management below, I hope to show how seemingly paradoxical responses – including the collection of less and/or less precise data – can be understood as “logical” amid the broader historical and political context in which agents act, but also how these choices in turn undercut agents’ ability to effectively intervene around their charges.

⁶ Recovery goals for the Northern Rocky Mountain region were 30 breeding pairs with a metapopulation of 300 wolves for a period of 3 successive years, divided among and with genetic exchange between the three sub-regions of Northwest Montana, Greater Yellowstone, and Central Idaho (USFWS, 1987).

⁷ Department of Defense and Full-Year Continuing Appropriations Act 2011 (Public Law 112-10, April 15, 2011); see also Perry (2012), who discusses the potentially significant precedent of this unconventional move.

Figure 2. Key environmental regulations

Acronym	Name	Date	Citation	Effects
NEPA	National Environmental Policy Act	1969	Public Law 91-190, 83 Stat. 852, January 1, 1970	Requires all executive federal agencies prepare environmental assessments (EAs) and environmental impact statements (EISs) on potential environmental effects of proposed agency actions.
ESA	Endangered Species Act	1973	Public Law 93-205, 87 Stat. 884, December 27, 1973	Charges the U.S. Fish and Wildlife Service and the National Marine Fisheries Service to conserve and recover species and ecosystems on which they depend.
FLPMA	Federal Land Policy and Management Act	1976	Public Law 94-579, 90 Stat. 2743, October 21, 1976	Establishes policy guidelines for public lands management, protection, and development.
NFMA	National Forest Management Act	1976	Public Law 94-588, 90 Stat. 2949, October 22, 1976	Requires the U.S. Forest Service to implement systematic and interdisciplinary approach to timber resource management.
EAJA	Equal Access to Justice Act	1980	Public Law 96-481, 94 Stat. 2325, October 21, 1980	Authorizes payment of attorney's fees to the prevailing party in successful legal action against the US government.

3.1. The choppy seas: complex systems and contrary aims

3.1.1. From timber extraction to ecosystem management

“...[E]cosystems ... are so complex that it is difficult or impossible to predict in advance the full implications of proposed management actions” – MacCleery (2008)

From the mid-20th century, management of federal forest lands begins a transition from the custodial and timber production roles outlined in the 1897 Organic Act toward concern with a broader set of non-extractive “uses, outputs and values” (MacCleery, 2008).⁸ Mobility and affluence in the post-war era led many to look to public lands as a site of recreation, and the 1960 Multiple-Use Sustained Yield Act gave the USFS authority and funding to administer lands not only for timber, range, and watershed, but also as wildlife habitat and for recreation.⁹ In the 1970s these concerns underwent further expansion in response to advances in ecological science that highlighted complexity and “nonequilibrium” processes (May, 1977; Picket et al., 1992; Suding et al., 2004), as well as an increasingly environmentally-minded public and regional economic and demographic transitions (Hines, 2010, 2011; Bryson and Wyckoff, 2010). The USFS’s guiding philosophy and prioritization thus shifted from “get out the cut” (maximizing commodity timber production) to “ecosystem management” (cf. Hays, 1959, 69-70; Sayre, 2017).

The USFS’s increasingly diverse “customer base,” now including recreationists, environmentalists, as well as local communities still reliant on extractive industries, was reflected in the establishment of Idaho’s Sawtooth National Recreation Area in 1972, which enshrined a

⁸ The Forest Service Organic Administration Act of 1897 (16 U.S.C., June 4, 1897).

⁹ The Multiple-Use Sustained-Yield Act of 1960 (Public Law 86–517, 74 Stat. 215, June 12, 1960).

commitment to “...natural, scenic, historic, pastoral, and fish and wildlife values and...recreation values.”¹⁰ Balancing the needs of ecosystems with the desires of diverse stakeholders, however, was easier said than done, especially when these were framed in mutually exclusive ways. To quote one agent, “...it’s a real challenge with the Forest Service because... some people ... say you need to graze more cattle, some people say you don’t need to be grazing any.”¹¹

The combination of a new ecologically-informed approach and the demands of an increasingly diverse and vocal public pushed the Forest Service toward *adaptive management*, which stressed incomplete knowledge in the face of socio-ecological complexity and thus aimed to “learn by doing” while opening up to more collaborative approaches.¹² This new approach necessitated a “strong commitment to monitoring” as well as “considerable on-the-ground coordination,” as certain forms of data became all the more important for navigating uncertainty, and stakeholder collaboration grounded work in local geographies and histories (Schreiber et al., 2004, 178; MacCleery, 2008).

3.1.2. *Managing a moving target*

“Conservation of wolves requires management... Without management, conservation is overcome by conflict” – Idaho Wolf Conservation and Management Plan (ILWOC, 2002, 4)

As the Northern Rocky Mountain wolf population met recovery goals beginning in 2000, attention turned to ESA delisting and devolution of management to the states. The U.S. Fish and Wildlife Service could propose delisting of regional wolf populations once recovery goals were met and it was “reasonably assured” that the population would not become threatened upon removal of protections (USFWS et al., 2003, 30). Idaho’s 2002 Wolf Conservation and Management Plan was deemed an “adequate” regulatory mechanism, with IDFG management to be tested under the 5-year oversight period beginning in 2011 (ILWOC, 2002; USFWS et al., 2004, 33, 37).¹³

Delisting minimum metrics were known as “15-150”: 150 wolves and 15 “breeding pairs” (defined as an adult male and female with two pups that survived until December 31st of that year) in the state. The 2002 plan notes that “[m]onitoring wolf populations is the cornerstone of a management program,” and “best done with radio telemetry” (ILWOC, 2002, 20). Standard practice by USFWS and IDFG involved helicopter darting, net-gunning, or leg-hold trapping for wolf capture, radio collaring (often with an aim of at least one collared wolf per pack), and subsequent monitoring via airplane (USFWS et al., 2004, 25). IDFG biologists put in substantial effort to collect data to get the state from recovery to full delisting, “pulling out all the stops” during oversight with a year-round effort and full-time staff. While plans and oversight set quantitative targets as legal requirements, estimates became increasingly meaningless over time, and managers expressed cynicism around monitoring techniques: as one game manager noted, such methods were “hugely

¹⁰ Sawtooth National Recreation Area Act (86 Statute 612, Public Law 92- 400, August 22, 1972).

¹¹ For similar findings and complementary narration based on USFS interviews, see Brugger et al. (2020).

¹² On adaptive management, see Holling, 1978; Walters, 1986; Walters and Holling, 1990; Schreiber et al., 2004.

¹³ IDFG was kept out of the recovery and management process between 1994 and 2003 by a state legislature that rejected the legitimacy of the reintroduction action (Idaho Code §36-715). During this period, USFWS funds were funneled to the Nez Perce tribe, who played a central role in on-the-ground management and monitoring. It was only in anticipation of delisting that Idaho moved to allow IDFG to coordinate with the USFWS and implement the 2002 state plan (ILWOC, 2002; USFWS et al., 2000, 20; 2003, 36; 2004, 37; ILWOC, 2002, 7).

expensive to try to do...on any scale,” and their quantitative targets “sure as hell...hard to prove.”¹⁴ Furthermore, “putting [radio] collars out” was “not the end goal,” and felt like “a pacifier,” “making people feel good” with the “illusion of control.”

Although IDFG’s mission is to “preserve, protect, and perpetuate” *all* wild animals in the state (IDFG, 2015), it is financially tied to a constituency of hunters, fishers, and trappers – as informants put it, IDFG is “in the business of selling deer and elk,” and “mandated under the legislature...to be responsive to [livestock] depredations.” IDFG thus strives to balance ecological and socio-economic concerns, including “protection of livestock, state-managed big-game populations, wolf conservation, and funding” (USFWS et al., 2003, 30; Fogleman, 2017, 567). The 2002 plan, the official governing document for Idaho wolf management, makes zero reference to the benefits of wolf return except for a vague “national interest”; focus is instead placed on the added costs wolves represent: directly, through management, and for livestock and hunting interests (ILWOC, 2002, 18, 22).¹⁵ Furthermore, the IDFG commission is appointed by the governor – a position held during the period covered here by Butch Otter (R), who saw elk “as the state’s wild livestock,” and wanted to be “first in line” for a tag to kill a wolf.¹⁶ The 2002 plan makes clear early on the state’s opposition to having any wolves, but concedes that Idaho will manage “at recovery levels” to “prevent the wolves from being delisted” (ILWOC, 2002, 4, 17, 18). This puts IDFG agents in a challenging position, charged with managing for population recovery by a government and amid constituencies opposed to wolf presence.

3.2. The whirlpool: doing more with less

3.2.1. Fewer boots on the ground

“What happens generally is somebody retires, and then... we don’t replace ‘em... other people just sort of take over those duties?” – Robin Garwood, USFS Wildlife Biologist

Those with the Forest Service recalled the importance of monitoring to assess environmental trends and plan interventions going back to the 1970s. Such work, however, was time and labor intensive: in backcountry Idaho, “monitoring” meant getting on horseback and travelling to rugged, remote ranges. Stakeholder collaboration, similarly important to adaptive management, required time: collecting public comment, building trust, and coming to agreement. Despite these needs, USFS budgets declined in real terms over the late 20th century, with disproportionate effects on field offices tasked with carrying out this work. Some districts in the Pacific Northwest saw full-time employment reductions of 30 to 50% between the 1990s and early 2000s, while emphasis on “management efficiency” and the threat of outsourcing to the private sector made for additional workforce anxiety (cf. MacCleery, 2008; Brugger et al., 2020, 70).

Remaining career employees keep things workable and provide continuity, but they can only do so much. With 22 years of experience, one ranger said he knew the grazing allotments as well or better than his permittees, but the two local range technicians had each only been in the area for a year (and as one rancher put it, “you don’t get to know the range in a year!”). One wildlife biologist

¹⁴ The “breeding pair” metric was particularly challenging, as pup death or other non-detection – not infrequent – would result in the “loss” of the breeding pair.

¹⁵ Notably, the state plan refers to wolves’ impact on native prey species as “depredation” (ILWOC, 2002, 18), a term normally associated with animal take of human resources like crops and livestock.

¹⁶ Quoted in Russell (2009).

explained how staff reduction resulted in increased workloads on those that remained; while agents “get used to” such conditions, they also recognize the consequences of underfunding and understaffing, as things “fall through the cracks,” monitoring and permit administration goes undone (sometimes for years at a time), unauthorized uses go unchecked, and scientific questions remain unanswered (cf. Moir and Block, 2001).

Community involvement in resource management can of course be beneficial: increasing buy-in, benefitting from experiential knowledge, tailoring practices to local conditions, and addressing historical problems of top-down state management for local people (Hays, 1959; McCarthy, 2007, 179-180; Charnley et al., 2014). Yet shifts toward community-based resource management and collaborative decision-making take on a different tone in this context. Such efforts are simultaneously responses to a “crisis of legitimacy” in state forestry and might be viewed as an effort to “give the job to someone else” – a trend “uncomfortably complementary to the rise of neoliberalism” (McCarthy, 2007, 179-181; cf. Harvey, 2009). Faced with the pressing need to do more with less, stepping back from a leadership role has the advantage of leaning on resources and expertise beyond the agency. Yet this strategy has questionable long-term viability, as collaborative efforts themselves are hindered by cuts.

3.2.2. *Monitoring on a budget*

“Although [radio telemetry] worked well with initial small population sizes, these techniques are no longer appropriate or cost-effective given the current, much larger recovered population size and near-statewide distribution” – Rocky Mountain Wolf Recovery 2003 Annual Report (USFWS et al., 2004, 29)

Under USFWS oversight, wolves were carefully monitored using collaring and radio telemetry (see Fig. 3); for small populations, such methods were feasible and reliable, and produced important information on territory, density, dispersal, breeding status, pack size, and composition (Stenglein et al., 2010, 1050). However, wolves are elusive and highly mobile, making them a challenge to track and “hard to count.”¹⁷ Rapid reproduction and territorial expansion created further challenges, with monitoring becoming increasingly less reliable, time-consuming, and cost-prohibitive, with multimillion-dollar annual budgets.¹⁸ The specter of delisting thus raised questions about the feasibility of long-term wolf population monitoring, especially as the end of federal oversight would remove quantitative benchmarks and substantially reduce available federal resources. As early as 2003, then, Idaho began developing “less intensive” post-delisting protocols (USFWS et al., 2002, 2004; Mitchell et al., 2008; Bangs, 2010).

In 2015, IDFG hired wildlife biologist Dr. David Ausband to adapt and implement more cost-effective methods of data collection appropriate to the ecological and regulatory context of full state management (Stenglein et al., 2010; O’Connell, 2015). Ausband’s first effort, the “rendezvous site model,” used wolf behavior and life history patterns to help researchers more efficiently find wolves without the use of radio collaring. A predictive habitat model locates probable sites of pack concentration (often wet meadows), which in turn guide on-the-ground survey efforts. Researchers confirm wolf presence at a site through visual inspection and/or howl surveys (in which pre-

¹⁷ A problem compounded by the rugged and remote terrain of Idaho, where aerial transects have limited utility given a lack of open habitat and inconsistent snow conditions (Ausband et al., 2010, 2014).

¹⁸ Even with a target of only one member of each pack collared, USFWS faced annual budgets for regional wolf recovery of over \$2 million per year. The Idaho state plan shows monitoring costs at nearly a quarter of estimated budget (ILWOC, 2002, 25); one agent recalled spending “tens of thousands of dollars a day sometimes,” while another quoted a figure of “a million dollars a year on monitoring and management” during oversight.

recorded wolf howls are played and responses noted), and collect hair and scat samples that are subjected to DNA analysis.

This approach reduced time and labor costs of population surveys while producing useful data on pack pedigree, distribution, and minimum counts (Ausband et al., 2010; Stenglein et al., 2010; Stansbury et al., 2014). However, even with the cheapening of lab procedures (Stenglein et al., 2010, 1057), this was still deemed too costly. Increasingly central to IDFG’s wolf effort today, then, is the “patch occupancy model” (Ausband et al., 2014; Mitchell et al., 2016), in which data streams from rendezvous site visits, hunter surveys, and camera traps are put into an algorithmic framework that produces estimates on presence and trend.¹⁹

Figure 3. Wolf monitoring technologies and transitions

Responsible party	Dates	Technologies employed	Data produced
USFWS (federal)	1995 – 2011*	Radio collaring and telemetry	Population estimates, pack location and composition
IDFG (state)	2011 – 2016 (oversight period)	Radio collaring and telemetry	Population estimates, pack location and composition
IDFG (state)	2016 – present	Rendezvous site model	Minimum population estimates, pack distribution, composition, and pedigree
		Patch occupancy model	Presence and trend estimates

*See note 13

These modeling techniques reflect IDFG concern with *population* – presence, persistence, and impacts – rather than the specific *number* of individuals or packs. As noted above, complex dynamics and wide-ranging behavior hinder easy tracking and quantification of wolves, yet many environmental organizations still base lawsuits and contestation of management practices on numbers. While concerns around over- and under-reporting of populations and the effects of human-caused mortality are important (Treves et al., 2017; Darimont et al., 2018), framings like that of Creel et al., – “[c]learly defined, quantitative policy goals are needed for science-based evaluation” – conflate scientific rigor with quantification, seem to ignore the intrinsic uncertainties of detection and modeling, and run at odds with the concerns and practices of managers (2015, 1475, emphasis in the original; cf. Porter, 1995).

Use of modeling *is* complicated, however, by the introduction of annual wolf hunting seasons. While “harvest” appears contrary to maintaining a viable population, hunting seasons were a central pillar of management plans developed in Idaho, Montana, and Wyoming (Gude et al., 2012, 109); Idaho expressed its intent early on to transition wolves to a “big game species” managed like any other (ILWOC, 2002, 4). IDFG managers are quick to point out that hunting has “worked remarkably well,” success rates remain low, and the practice brings wolves closer in line with other species managed off harvest data (including black bears and mountain lions, both of which have legal hunting seasons in the state). However, the effects of human “take” on wolf demography remain poorly understood; and, crucially, modeling appears to lose efficacy with increasing mortality rates (Mitchell et al., 2008, 883, 888; Ausband et al., 2010, 1048; Gude et al., 2012).

¹⁹ Research is currently underway to improve these techniques “within an adaptive management framework” (Mitchell et al., 2016, 3-4), with similar approaches taken up in Finland (Granroth-Wilding et al., 2017) and the Iberian Peninsula (López-Bao et al., 2018).

There is already no easy conversion from presence to population count, with estimated state numbers based on significant assumptions and biases resulting from the interplay of technology, species behavior, and geography: "...we can't say how biased that estimate [of average pack size] is, because it's based on packs that we can monitor well enough to know how many wolves there are at the end of the year... packs we can get to most easily." Studies and experience show that wolf populations can withstand substantial human caused mortality without declining (ILWOC, 2002, 10; Bangs, 2010), but IDFG biologists admit that "we don't know" the number below which wolves will no longer have a self-sustaining population (cf. Darimont et al., 2018; Creel et al., 2015).²⁰

Implementation of hunting as a social, rather than ecological, intervention, however, has been relatively successful: both reported livestock depredation incidents and social opposition to wolves are said to have declined since 2008, attributed by many to the inception of hunting seasons (cf. ILWOC, 2002, 22).²¹ Yet the tension between maintaining a viable population along with the support of constituencies with contrary motivations has IDFG walking a razor's edge – and, increasingly, without the data to inform management choices. While wolf numbers are not going into free-fall, "success" may be due more to wolf resilience and Idaho topography – a "rapidly growing population with a protected core" (Mitchell et al., 2008, 889-890) – than with the soundness of their current approach.

3.3. The monster: legal and political pressure

3.3.1. Legal challenges and process gridlock

"Too often, the Forest Service is so busy meeting procedural requirements, such as preparing voluminous plans, studies, and associated documentation, that it has trouble fulfilling its historic mission: to sustain the health, diversity, and productivity of the nation's forests and grasslands to meet the needs of present and future generations. Too frequently, the paralysis results in catastrophe" – "The Process Predicament" (USFS, 2002)

Although created in response to legitimate environmental concerns, implementation of NEPA, FLPMA, and related legislation are often described by agents as adding to the workload, resulting in "process gridlock" and inefficiencies in decision-making (MacCleery, 2008). Regulation creates new demands on time and attention – recall the monitoring requirements of adaptive management (3.1.1) – but the threat of lawsuits pushes agencies to add protective redundancy to documentation ("overkill") at the expense of other management responsibilities (Karkkainen, 2002; USFS, 2002; Brugger et al., 2020). Agents point to binders full of biological opinions, impact statements, and grazing rules, but say that these do little to inform practical decision-making.

ENGO lawsuits are often based around regulations that may have become disconnected from on-the-ground realities: grazing season on- and off-dates are fixed, yet cannot reflect seasonal and annual variation of pasture condition; AUMs (animal unit months – a measure of pasture usage) are based on an abstraction that ignores individual grazer variability as well as changes in the breed. USFS agents noted that while putting GPS collars on livestock might help them monitor impacts and respond to problems, doing so would also open the agency and livestock operators to litigation if animals stepped over the often-arbitrary boundaries associated with allotment grazing plans. Suits

²⁰ While there are currently none of the "old bars" of minimum wolf population numbers in Idaho, the USFWS can be petitioned at any time to investigate wolf population status. This raises an interesting legal question (beyond the scope of this paper): if the USFWS wants IDFG to "show them their numbers," but there is no federal funding for monitoring in such a fashion, what is the state's obligation?

²¹ Verification of these claims would require significant further research.

can even be brought for failure to meet deadlines (Fogleman, 2017, 572), common given capacity gaps and exacerbated by litigation itself.

Livestock producers expressed both frustration and sympathy: “...the agencies have really dug themselves a hole. They’ve come up with so many regulations, they can’t keep up with them”; “...they don’t have time. All they’re doing is answering...questions and trying to get things done so they can comply with all the regulations that they made. And they’ve cut their budgets so where they don’t have too many personnel.” While they admitted that agents were often making their best effort, ranchers saw these as misdirected: rangers were “bogged in paperwork” rather than “on the range”; regulations could be “absurd” and disconnected from ecological and geographical realities; and environmental organizations used these rules “to beat them” in the legal realm.

Since the EAJA, many environmental organizations have turned litigious, funneling fundraising into legal teams and using lawsuits as a primary tool for pushing change. Some ENGOs aim to eliminate public lands grazing entirely, explicitly framing livestock as incompatible with conservation and an illegitimate use of public land (often as “welfare ranching”) (Wuerthner and Matteson, 2002; cf. Rowley, 1985; Brugger et al., 2020).²² While right-wing claims that ENGOs are “running a business” through litigation (i.e. profiting from lawsuits) are inaccurate and overplayed, litigious environmentalism has resulted in skepticism, distrust, and sometimes extreme animosity (Baier, 2016; Fogleman, 2017).

Environmental governance has long embodied a “tension between the centralizing tendencies of system and expertise on the one hand and decentralization and localism on the other” (Hays, 1959). MacCleery (2008) connects “process gridlock” to a disconnect between the management and regulatory apparatus – i.e. between natural resource agencies and the courts – and the failure of the latter to embrace adaptive management. Managers find themselves trapped “between powerful interest groups and inflexible legislation” (Treves and Ullas Karanth, 2003, 1496), while interpretation of environmental law is left in the hands of judges rather than scientists or to political debate. Too often this has resulted in the “blunt instrument” of injunction and *further* NEPA assessment, continuing the cycle of dysfunction (MacCleery, 2008; cf. USFWS et al., 2003, 32; Brugger et al., 2020, 69).

3.3.2. *Wolves’ symbolic importance*

“The human dimension is ultimately the most important component in management of this species” – Idaho Wolf Conservation and Management Plan (ILWOC, 2002, 21)

Reintroduced wolves were “high profile” from the beginning, revered by some and violently opposed by others. Although competition with humans – particularly around livestock depredation – is often cited as the source of contention, controversy far exceeds wolves’ material and economic impacts. As former USFWS wolf recovery coordinator Ed Bangs puts it, “we debate human values through them”: both pro- and anti-wolf stakeholders enroll the animal in broader political struggles, drawing on the complex symbolic register of the wolf. Thus regardless of techniques used or the number of wolves in the state, some group was always upset. As one game manager explained:

“[We] get both sides! You’re soft on wolves, you’re not killing wolves, wolves are killing my livestock, wolves have ruined my hunting opportunities, wolves have ruined my outfitting

²² Such views have been noted and critiqued by many environmental historians and political ecologists on the bases of both ecological science and the often-observed socio-environmental history of place (e.g. Peluso, 1992, 1993; Cronon, 1995; Neumann, 1998; Kosek, 2006; Sayre, 2017).

business, you guys aren't doing enough, you're to blame, you caused them to come here, you said it was great, you're all just a bunch of environmentalists, and would like to use wolves so that you can cancel hunting seasons and take our guns away...'

And at the same time, the other extreme... 'wolves are special and they're a religious symbol and they should never be killed for any reason, we should have a lot of them, we should have them everywhere and we should evacuate all people from wilderness permanently.'"

While the aim of state and federal managers was to get wolves recovered and delisted, efforts to "not put 'em on a pedestal" have thus far been unsuccessful; wolf management remains "a special case" subject to intense social scrutiny and extreme public opinion. IDFG agents note their inability to manage wolves using methods used for other species, or from an ecosystemic (as opposed to single-species) approach, while scholars have noted the downsides of a "public involvement" that undermines the principles of adaptive management itself (e.g. Treves and Ullas Karanth, 2003, 1496). IDFG agents expressed cynicism over input that felt disconnected from realities on the ground (including opposition to radio collaring wolves in the wrong times and places, or the removal of problem wolves as per the state management plan) (ILWOC, 2002; Chaney, 2016; 2017).

Polarization has broader political consequences as well. The back-and-forth leading up to delisting is often cited as environmentalists "going back on the deal," a process through which, Bangs notes, "we taught hunters to hate wolves" (cf. USFWS et al., 2003, 31). While data on wolf location once helped coexistence collaboratives avoid livestock depredation and reduce conflict, social and legal controversy later made IDFG agents hesitant to share that information given the possibility of targeted killings (cf. USFWS et al., 2000, 15, 18; 2004, 36–37). Thus while wolf recovery has been "remarkably successful" from a population ecology standpoint – one of the great conservation achievements of the 20th century (Mech, 1995) – socio-political controversy creates what one IDFG manager called "the most challenging aspect of wildlife management right now."

4. Thinking through illegibility

"You just kinda have to deal with it... otherwise you just bury your head in the sand and hope for the best" – Kurt Nelson, USFS District Ranger

4.1. A limited vision

To return to the conceit with which we began, USFS and IDFG agents are sailors on the choppy seas of socio-ecological complexity. As environmental agencies have internalized advances in ecological science and confronted the socio-political challenges of environmental governance, they have sought to navigate these new seas through adaptive management and collaboration. However, monitoring, learning-based approaches, and stakeholder collaboration require substantial outlay of labor time and resources. These have been undermined by cuts to capacities and political pressures – the whirlpool and the monster – in a spiraling feedback loop: cuts lead to failures to accomplish aims and comply with regulations, resulting in lawsuits that further hinder productive agency practice and leave adaptive management an "unrealized promise" (MacCleery, 2008; cf. Moir and Block, 2001; Schreiber et al., 2004).

Complexity and indeterminacy are increasingly recognized as pervasive in scientific research and decision-making processes, especially with non-linear and intractable "wicked problems" like those described above (Rittel and Webber, 1973). Environmental uncertainty presents a certain "intractability to government" (Li, 2007, 18), which informs Scott's central argument (1998): modernist schemes have frequently *failed*, with significant environmental and social impacts. But

intractability is more than a result of complexity and indeterminacy. The USFS is asked to resolve land use questions amid a lack of societal consensus on the proper use of public lands. IDFG seeks to maintain wolf populations while dodging opposition from all sides (as wolf biologists often say, “everybody hates managers”). Collaborative efforts around range management and nonlethal coexistence struggle amid polarization and limited funding.²³ And while collaboration can increase local buy-in and adaptability – as one rancher put it, “trust creates flexibility” – it is “hard to be adaptive if everything has to be sued in court.”

As arbiters of competing social claims, agencies cannot please everyone (Hays, 1959, 58). To quote a game manager with over 25 years’ experience, “it comes down to, yeah we’re managing for multiple uses, and... multiple species, and different desired outcomes from an enormous range of constituents... they want to see different things. And the difficult part lies in... desires that are completely incompatible with each other.” Yet faced with the Scylla and Charybdis of reduced capacities and social controversy, agents take on a defensive position, “keeping afloat” amid frustration and “muddling along” from crisis to crisis. Usage of one technology or another, decisions on whether and how to measure a given process or population, and the margins of error inherent to modeling produce different forms of knowledge and nonknowledge. Ambiguity, conflicting facts, and technological blind-spots emerge, as certain research does not get done and certain questions cannot be answered.

Scott argues that techniques of legibility make natures and societies “susceptible to careful measurement and calculation” by bringing *certain* aspects of an otherwise “complex and unwieldy reality” into sharper focus and stronger control (1998, 11). In so doing, however, these create their own form of *blindness*: abstracting away consequential complexity and “opening a gap between events on the ground and their official representations” (Sayre, 2002, 169; cf. Porter, 1995; Li, 2005, 388-390). But the seemingly irrational outcome of nonknowledge seen here is not a result of the failure to capture socio-ecological complexity; rather, it is a result of the undermining of agents’ ability to intervene and collaborate around complicated and controversial issues – a different form of “limited vision” that I term *illegibility*.

4.2. *Illegibility as political strategy*

What is the political intelligibility of unintelligibility? Especially as the state appears to set agency priorities with one hand while undercutting its ability to pursue those priorities with the other (cf. Brugger et al., 2020, 73), how do we account for the perpetuation of this seeming paradox? McGoeys argues that efforts to know *less* should be understood not as a breakdown in rationality, but rather as “indicative of a rational strategy itself” (2007, 228). Through “practices of obfuscation” (2012b, 555), and “knowing the *least* amount possible” (2012a, 3, emphasis in the original), organizations and individuals manage risks and exonerate themselves from blame. The generation of ignorance and imprecision takes on a *purposefulness*, then, whether “intentional” or not (cf. Murphy, 2006; Pred, 2007).

As agencies have moved toward prioritizing ecological concerns (and increasingly defined these as the basis of their authority) (cf. Kosek, 2006, 68), they have created challenges for other state actors and interests. Uncertainty does not easily translate into policy and law, which continue to seek quantification, prediction, and “objectivity” (Porter, 1995; Robertson, 2006). Ecological science may

²³ Nonlethal management, generally more labor- and knowledge-intensive, may be less attractive to strapped agencies, but is further undercut by endorsement of lethal control by the same agency (cf. ILWOC, 2002, 19).

also raise concerns and elicit policy directions inimical to other priorities; an ecosystemic approach might be seen as too inconvenient, costly, or contrary to other aims (such as private accumulation). Yet redirecting practices away from ecological aims has become increasingly difficult to do on the basis of science and “the facts,” particularly as scientific and legal expertise increasingly extend beyond the state.

By decreasing the ability to determine public priorities (through collaboration) or carry out environmental sustainability (through adaptive management), illegibility “from above” appears bound up with a reworking of relations between the state and science: reducing responsibility to the public and undermining the very means and logic of contestation. *Undermining* agents’ ability to carry out certain tasks – resulting in the production of less and/or less precise data – reduces the state’s vision of, and thereby responsibility around, ecosystemic priorities (cf. McGoey, 2007, 2012a, 2012b). Cuts take agencies out of public debates, remove them as a terrain of political struggle, and provide cover for the reorientation of priorities.²⁴ Illegibility becomes a means to contain political challenge, as perhaps the latest incarnation of the neoliberal turn; to mix metaphors, cuts become a means to “starve the beast.” Beyond the political demobilization of rendering technical, this is a further deflection and deniability: of not knowing, of “seeing no evil” (cf. Ferguson, 1994; Li, 2007; McGoey, 2007, 2012a, 2012b).²⁵

The current administration’s “proclivity to dismiss evidence-based claims,” in which opposition and critique become “fake news” while “alternative facts” justify pre-decided policy directions (Dillon et al., 2019, 545, 547), can be seen, then, as the continuation of a longer historical arc (cf. Pred, 2007). Illegibility provides cover for and the dismantling of regulation and publicly-funded research and for corporate capture of regulatory agencies (often by companies with long histories of manufacturing doubt) (cf. Proctor and Schiebinger, 2008; Oreskes and Conway, 2010; Dillon et al., 2019).²⁶ Li argues for “a continuum” between coercive, authoritarian government and Foucauldian, governmentality-style approaches (2005, 387); perhaps what we see here then is a swing of the pendulum, as the germ of anti-democratic politics has grown bolder and more boisterous, from “low-key fascism” into full-blown authoritarianism (Pred, 2007, 376; McCarthy, 2019).

4.3. Illegibility as defensive adaptation

In the American West, neoliberalization layers atop longer-standing anti-federal and anti-regulatory sentiment, with budget cuts occurring in conjunction with revived efforts for deregulation, the privatization of public lands, and attacks on the ESA.²⁷ Agents charged with the management of politically-significant species and environments confront a pressing need to do more with less. Technologies like Ausband’s modeling (3.2.2) facilitate the gathering of data “better, faster, and cheaper,” and even assist with intervention and collaboration toward the avoidance of conflict (Adams, 2017, 7-9; Ausband et al., 2010, 1047). Yet far more important than the technologies in and

²⁴ This is seen at the national level in reduction of agency staff and financial support for government science (Alemany, 2017), as well as the removal of resources on climate change from the EPA’s website (Dillon et al., 2019).

²⁵ Akin, perhaps, to Odysseus’ command that his sailors stop their ears with wax to avoid the sirens’ temptation?

²⁶ It is worth noting similar moves present among other discourses of popular skepticism, from anti-vaxxers to anti-grazers, who seek not scientific consensus but to assert their own “truth” (cf. O’Neill 2007, 159-163).

²⁷ Indeed, Scott’s own read of bureaucratic power and its failures at times fits too easily with anti-state and anti-regulatory arguments; it is not far from Scott to Hayek (cf. Tilly 1999).

of themselves are the social relations and context in which technologies are adopted, used, and governed.²⁸

Much of the literature from science and technology studies stresses the power of scientists and state agents (although cf. Robertson, 2006). In contrast, I have argued that states and their agents produce and deploy both knowledge *and* ignorance in complex ways, with scientists and managers subject to structural pressures and constraints. Illegibility here becomes not a consolidation or source of power, but a symptom of weakness, distinguishing this analysis from other work on agnotology (Proctor and Schiebinger, 2008; Oreskes and Conway, 2010), and complicating McGoey's analysis of ignorance as institutional resource (2012b). By emphasizing the situatedness of agents' choices (cf. Haraway, 1988; Pred, 2007), we highlight the on-the-ground challenges of living and working amid such conditions – to quote a former Forest agent, “it is not fun going through appeals... litigation... congressional inquiries, going through defensive type posturing to do your job.”

As Li notes, depoliticization is a project, not a *fait accompli* (2007, 10); even as agents' practices serve to reproduce structures of power and knowledge, contestation, resistance, and reversals from within the state may still be possible (cf. Mitchell, 1991, 93; Ferguson, 1994, 18; Li, 2005, 385). McGoey provocatively notes that “[t]he creative use of ignorance has been key to the regulator's survival” (2007, 232; cf. 2012a, 12). As agents make decisions amid circumstances not of their own choosing, might we conceive of illegibility in part, too, as a form of “resistance,” an inversion of Scott's “weapons of the weak” (2008) here wielded by state agents themselves?

5. Over the horizon

“If it's worth doing, then it's worth doing – but it's gonna cost money” – Kurt Nelson, USFS District Ranger

Odysseus ultimately steers toward the monster Scylla, losing only a few sailors rather than his entire ship to the whirlpool Charybdis. Similarly, although politicization and litigation are serious problems for environmental governance, defunding represents the greater threat. With science under political attack and governments continuing to push tax cuts and privatization in the face of looming socio-ecological challenges, agencies become potential sites of contestation and struggle, opening opportunities for new alliances, practices, and directions (cf. Charnley et al., 2014; Dillon et al., 2019). As of this writing, IDFG is finalizing a new wolf management plan with clearer operational guidance and criteria around population targets, while the USFS is working to establish a new Forest Management Plan for 2019 – revising regulations, striking a balance among multiple uses, and streamlining NEPA decision-making processes (USFS, 2017). Such efforts, however, can only go so far without adequate support.

As environmental demands increase – with increasingly complex challenges of coexistence and climate change-related crises – muddling along, reliance on the extra effort of individual agents, and literally papering over contradictions are all non-solutions. Flawed though efforts have been over the years (cf. Hays, 1959), environmental governance is not improved by cuts to state capacities; this is

²⁸ While the coercive potential of such technologies has made them an object of critical scholarship and justice concerns (Adams 2017; cf. Peluso 1993), such a narrative can be critiqued for its implicit correspondence between knowledge (here, mediated via technology) and power. Not only, following Arts et al., should we avoid “hypes, techno-fix thinking, good news narratives and unverified assumptions” (2015, S661), but we should also question gloom-and-doom narratives, functionalist thinking, and the simple conflation of legibility and power. Missing from these is a conceptualization of technological choices as situated social practice.

the model of neoliberal austerity, in which programs are defunded until they fail. USFS and IDFG agents face significant structural challenges that undercut their ability to carry out their responsibilities, while failures add fuel to those questioning their legitimacy and raise the specter of abrogation of responsibility through public lands transfer or further ESA delisting.

We should follow Scott and others from STS in questioning assumptions of legibility, quantification, and abstraction in the face of socio-ecological complexity. But against the idea that “ignorance is bliss,” we should see illegibility not as the resolution of these contradictions but as symptom and source of dysfunction. State agents navigate seas not of their own choosing, fraught with indeterminacy, logistical limitations, unrealistic expectations, and socio-political conflict. Amid the resulting combination of frustration, cynicism, and pragmatism, a certain measure of performed ignorance provides a reprieve from scrutiny and blame, allowing agents to keep their heads down and “get on with their work” (Heimer, 2012, 35). McGoeys shows how the breakdown of making legible contains within it a rational strategy for navigating antithetical demands, while encouraging us to remember both “the at times systematic absurdity of bureaucracy” as well as the tacit logics behind seemingly illogical acts (2007, 217, 230–231).

I have sought here to situate both data and its production (Dillon et al., 2019, 549), and in so doing stress how the limits of knowledge production are not technologically determined but political and socially produced. By emphasizing the situated social practice of government agents charged with management of controversial natures – those embattled sailors caught between Scylla and Charybdis – we can better understand the seemingly illogical and dysfunctional results. Future research might build on these insights while raising a consideration of “worlds otherwise” (Brugger et al., 2020, 74), of how things might be different. At the very least, analysis of illegibility should further complicate views of bureaucratic rationality while painting a more complex relationship between knowledge (and ignorance) and power.

References

- Adams, William M. 2017. “Geographies of conservation II: technology, surveillance and conservation by algorithm.” *Progress in Human Geography*. 43(2): 337-350. <https://doi.org/10.1177/0309132517740220>.
- Agamben, Giorgio. 1998. *Homo Sacer: Sovereign Power and Bare Life*. Stanford University Press.
- Arts, Koen, René van der Wal, and William M. Adams. 2015. “Digital technology and the conservation of nature.” *Ambio*. 44(Suppl. 4): S661-S673. <https://doi.org/10.1007/s13280-015-0705-1>.
- Alemany, Jacqueline. 2017. “Science division of White House office left empty as last staffers depart.” *CBS News*, June 30, 2017. Accessed October 13, 2018. <https://www.cbsnews.com/news/sciencedivision-of-white-house-office-now-empty-as-last-staffers-depart/>.
- Ausband, David E., Michael S. Mitchell, Kevin Doherty, Peter Zager, Curt M. Mack, and Jim Holyan. 2010. “Surveying predicted rendezvous sites to monitor gray wolf populations.” *Journal of Wildlife Management*. 74(5): 1043–1049. <https://doi.org/10.2193/2009-303>.
- Ausband, David E., Lindsey N. Rich, Elizabeth M. Glenn, Michael S. Mitchell, Pete Zager, David A. W. Miller, Lisette P. Waits, Bruce B. Ackerman, and Curt M. Mack. 2014. “Monitoring gray wolf populations using multiple survey methods.” *Journal of Wildlife Management*. 78(2): 335–346. <https://doi.org/10.1002/jwmg.654>.
- Baier, Lowell E. 2016. *Inside the Equal Access to Justice Act: Environmental Litigation and the Crippling Battle Over America’s Lands, Endangered Species, and Critical Habitats*. Rowman & Littlefield.
- Bangs, Ed. 2010. “Service review of the 2009 wolf population in the NRM DPS.” United States Department of the Interior, U.S. Fish and Wildlife Service. April 26, 2010.
- Böschen, Stefan, Karen Kastenhofer, Ina Rust, Jens Soentgen, and Peter Wehling. 2010. “Scientific nonknowledge and its political dynamics: the cases of agri-biotechnology and mobile phoning.” *Science, Technology, & Human Values*. 35(6): 783–811. <https://doi.org/10.1177/0162243909357911>.
- Braun, Bruce and Noel Castree. 1998. *Remaking Reality: Nature at the Millennium*. Taylor & Francis.
- Brown, James D. and Sarah L. Damery. 2009. “Uncertainty and Risk.” In: Noel Castree, David Demeritt, Diana Liverman, and Bruce Rhoads (Eds.) *A Companion to Environmental Geography*. John Wiley & Sons, pp. 81–94. <https://doi.org/10.1002/9781444305722.ch6>.
- Brugger, Julie, Mitchel P. McClaran, and James E. Sprinkle. 2020. “‘Storytelling’ natural resource conflict on U.S. public lands.” *Ethnos*. 85(1): 54-78. <https://doi.org/10.1080/00141844.2018.1456476>.
- Bryson, Jeremy and William Wyckoff. 2010. “Rural gentrification and nature in the Old and New Wests.” *Journal of Cultural Geography*. 27(1), 53–75. <https://doi.org/10.1080/08873631003593232>.
- Chaney, Rob. 2016. “Forest Service Rules Idaho Wolf-Collaring Violated Wilderness Permit.” *The Missoulian*, January 20, 2016, Online edition, sec. Local. Accessed October 13, 2018. https://missoulian.com/news/local/forest-service-rules-idahowolf-collaring-violated-wilderness-permit/article_714f117d-faba-5a26-b84cbcc961a55f56.html.

- Chaney, Rob. 2017. "Update: Judge Orders Destruction of Data from Illegal Idaho Elk/Wolf Collaring in Wilderness." *The Missoulian*, January 19, 2017, Online edition, sec. Local. Accessed October 13, 2018. https://missoulian.com/news/local/update-judgeorders-destruction-of-data-from-illegal-idaho-elk/article_28645da0-16a7-5fc9-b6bd-742941e225e7.html.
- Charnley, Susan, Thomas E. Sheridan, and Gary P. Nabhan. (Eds.), 2014. *Stitching the West Back Together: Conservation of Working Landscapes*. University of Chicago Press.
- Creel, Scott, Matthew Becker, David Christianson, Egil Drøge, Neil Hammerschlag, Matt W. Hayward, Ullas Karanth, Andrew Loveridge, David W. Macdonald, Wigganson Matandiko, Jassiel M'soka, Dennis Murray, Elias Rosenblatt, and Paul Schuette. 2015. "Questionable policy for large carnivore hunting." *Science*. 350(6267): 1473–1475. <https://doi.org/10.1126/science.aac4768>.
- Cronon, William. 1995. "The trouble with wilderness; or, getting back to the wrong nature." In: William Cronon (Ed.), *Uncommon Ground: Rethinking the Human Place in Nature*. W.W. Norton & Co., New York, pp. 69–90.
- Darimont, Chris T., Paul C. Paquet, Adrian Treves, Kyle A. Artelle, and Guillaume Chapron. 2018. "Political populations of large carnivores." *Conservation Biology*. 32(3): 747–749. <https://doi.org/10.1111/cobi.13065>.
- Dillon, Lindsey, Rebecca Lave, Becky Mansfield, Sara Wylie, Nicholas Shapiro, Anita Say Chan, and Michelle Murphy. 2019. "Situating data in a Trumpian Era: the environmental data and governance initiative." *Annals of the American Association of Geographers*. 109(2), 545–555. <https://doi.org/10.1080/24694452.2018.1511410>.
- Ferguson, James. 1994. *The Anti-Politics Machine: "Development", Depoliticization, and Bureaucratic Power in Lesotho*. University of Minnesota Press.
- Fischer, Hank. 1995. *Wolf Wars: The Remarkable Inside Story of the Restoration of Wolves to Yellowstone*. Falcon Press.
- Fogleman, Valerie. 2017. "Surviving without nature." *Journal of Environmental Law*. 29(3): 565–578. <https://doi.org/10.1093/jel/eqx025>.
- Forsyth, Tim. 2003. *Critical Political Ecology: The Politics of Environmental Science*. Routledge.
- Foucault, Michel. 2007. *Security, Territory, Population: Lectures at the Collège de France, 1977–78*. Springer.
- Foucault, Michel. 2008. *The Birth of Biopolitics: Lectures at the Collège de France, 1978–79*. Springer.
- Ghose, Rina. 2013. "Big sky or big sprawl? Rural gentrification and the changing cultural landscape of Missoula, Montana." *Urban Geography*. 25(6): 528–549. <https://doi.org/10.2747/0272-3638.25.6.528>.
- Goldman, Mara J., Paul Nadasdy, and Matthew D. Turner. (Eds.) 2011. *Knowing Nature: Conversations at the Intersections of Political Ecology and Science Studies*. University of Chicago Press.
- Granroth-Wilding, Hanna, Craig Primmer, Meri Lindqvist, Jenni Poutanen, Olaf Thalmann, Jouni Aspi, Jenni Harmoinen, Ilpo Kojola, and Toni Laaksonen. 2017. "Non-invasive genetic monitoring involving citizen science enables reconstruction of current pack dynamics in a re-establishing wolf population." *BMC Ecology*. 17:44. <https://doi.org/10.1186/s12898-017-0154-8>.
- Gude, Justin A., Michael S. Mitchell, Robin E. Russell, Carolyn A. Sime, Edward E. Bangs, L. David Mech, and Robert R. Ream. 2012. "Wolf population dynamics in the U.S. Northern Rocky

- Mountains are affected by recruitment and human-caused mortality.” *The Journal of Wildlife Management*. 76(1): 108–118. <https://doi.org/10.1002/jwmg.201>.
- Haraway, Donna. 1988. “Situated knowledges: the science question in feminism and the privilege of partial perspective.” *Feminist Studies*. 14(3): 575–599. <http://doi.org/10.2307/3178066>.
- Harvey, David. 2009. *A Brief History of Neoliberalism*. Oxford University Press.
- Hays, Samuel P. 1959. *Conservation and the Gospel of Efficiency: The Progressive Conservation Movement*. Atheneum Press.
- Heimer, Carol A. 2012. “Inert facts and the illusion of knowledge: strategic uses of ignorance in HIV clinics.” *Economy and Society*. 41(1): 17–41. <https://doi.org/10.1080/03085147.2011.637332>.
- Hines, J. D. 2010. “Rural Gentrification as Permanent Tourism: The Creation of the ‘New’ West Archipelago as Postindustrial Cultural Space.” *Environment and Planning D: Society and Space*. 28(3): 509–525. <https://doi.org/10.1068/d3309>.
- Hines, J. Dwight. 2011. “The post-industrial regime of production/consumption and the rural gentrification of the New West archipelago.” *Antipode*. 44(1): 74–97. <https://doi.org/10.1111/j.1467-8330.2011.00843.x>.
- Holling, C.S. 1978. *Adaptive Environmental Assessment and Management*. John Wiley & Sons.
- Idaho Department of Fish and Game. 2015. “Fish and Game Mission Statement.” About Us. Idaho Fish and Game. September 30, 2015, Accessed October 13, 2018. <https://idfg.idaho.gov/about/mission/>.
- Idaho Legislative Wolf Oversight Committee. 2002. “Idaho Wolf Conservation and Management Plan.” Accessed October 13, 2018. <https://idfg.idaho.gov/old-web/docs/wolves/plan02.pdf>.
- Karkkainen, Bradley C. 2002. “Toward a smarter NEPA: monitoring and managing government’s environmental performance.” *Columbia Law Review*. 102(4): 903–972. <https://doi.org/10.2307/1123648>.
- Kleinman, Daniel Lee and Sainath Suryanarayanan. 2012. “Dying bees and the social production of ignorance.” *Science, Technology, & Human Values*. 38(4): 492–517. <https://doi.org/10.1177/0162243912442575>.
- Kosek, Jake. 2006. *Understories: The Political Life of Forests in Northern New Mexico*. Duke University Press.
- Latour, Bruno. 2005. *Reassembling the Social: An Introduction to Actor-Network Theory*. Oxford University Press.
- Lave, Rebecca. 2012. *Fields and Streams: Stream Restoration, Neoliberalism, and the Future of Environmental Science*. University of Georgia Press.
- Lave, Rebecca, Christine Biermann, and Stuart Lane. (Eds.) 2018. *The Palgrave Handbook of Critical Physical Geography*. Palgrave Macmillan.
- Li, Tania Murray. 2005. “Beyond ‘the State’ and Failed Schemes.” *American Anthropologist*. 107(3): 383–394. <https://www.jstor.org/stable/3567024>.
- Li, Tania Murray. 2007. *The Will to Improve: Governmentality, Development, and the Practice of Politics*. Duke University Press.

- Loftus, Alex. 2018. "Political ecology II: whither the state?" *Progress in Human Geography*. 44(1): 139–149. <https://doi.org/10.1177/0309132518803421>.
- López-Bao, J. V., R. Godinho, C. Pacheco, F. J. Lema, E. García, L. Llana, V. Palacios, and J. Jiménez. 2018. "Toward reliable population estimates of wolves by combining spatial capture-recapture models and non-invasive DNA monitoring." *Scientific Reports*. 8: 2177. <https://doi.org/10.1038/s41598-018-20675-9>.
- Lorimer, Jamie. 2015. *Wildlife in the Anthropocene: Conservation After Nature*. University of Minnesota Press.
- MacCleery, Doug. 2008. "Re-inventing the United States Forest Service: evolution of national forests from custodial management, to production forestry, to ecosystem management." In: Patrick Durst, Chris Brown, Jeremy Broadhead, Regan Suzuki, Robin Leslie, and Akiko Inoguchi (Eds.) *Re-inventing forestry agencies: experiences of institutional restructuring in Asia and the Pacific*. Food and Agriculture Organization of the United Nations Regional Office for Asia and the Pacific. <http://www.fao.org/docrep/010/ai412e/AI412E06.htm>.
- Martin, Jeff Vance, Kathleen Epstein, Nicolas Bergmann, Adrienne C. Kroepsch, Hannah Gosnell, and Paul Robbins. 2019. "Revisiting and revitalizing political ecology in the American West." *Geoforum*. 107: 227–230. <https://doi.org/10.1016/j.geoforum.2019.05.006>.
- Marx, Karl. 1852. *The Eighteenth Brumaire of Louis Bonaparte*. Marxists Internet Archive. <https://www.marxists.org/archive/marx/works/1852/18th-brumaire/ch01.htm>.
- May, R. M. 1977. "Thresholds and breakpoints in ecosystems with a multiplicity of stable states." *Nature*. 269(5628): 471–477. <https://doi.org/10.1038/269471a0>.
- McCarthy, James. 2007. "States of nature: theorizing the state in environmental governance." *Review of International Political Economy*. 14(1): 176–194. <https://doi.org/10.1080/09692290601081244>.
- McCarthy, James. (Ed.) 2019. *Environmental Governance in a Populist/ Authoritarian Era*. Routledge.
- McGoey, Linsey. 2007. "On the will to ignorance in bureaucracy." *Economy and Society*. 36(2): 212–235. <https://doi.org/10.1080/03085140701254282>.
- McGoey, Linsey. 2012a. "Strategic unknowns: towards a sociology of ignorance." *Economy and Society*. 41(1): 1–16. <https://doi.org/10.1080/03085147.2011.637330>.
- McGoey, Linsey. 2012b. "The logic of strategic ignorance." *The British Journal of Sociology*. 63(3): 533–576. <https://doi.org/10.1111/j.1468-4446.2012.01424.x>.
- Mech, L. David. 1995. "Foreword." In: Hank Fischer. *Wolf Wars: The Remarkable Inside Story of the Restoration of Wolves to Yellowstone*. Falcon Press.
- Mitchell, Michael S., David E. Ausband, Carolyn A. Sime, Edward E. Bangs, Justin A. Gude, Michael D. Jimenez, Curt M. Mack, Thomas J. Meier, M. Steven Nadeau, and Douglas W. Smith. 2008. "Estimation of successful breeding pairs for wolves in the Northern Rocky Mountains, USA." *Journal of Wildlife Management*. 72(4): 881–891. <https://doi.org/10.2193/2007-157>.
- Mitchell, Michael S., Justin A. Gude, Kevin Podrutzny, Edward E. Bangs, Jim Hayden, Robert M. Inman, Michael D. Jimenez, Quentin Kujala, Daniel H. Pletscher, Jon Rachael, Robert Ream, and John Vore. 2016. "Management of wolves in the US Northern Rocky Mountains is based on sound science and policy." *Science*. eLett. 350 (6267). <https://doi.org/10.1126/science.aac4768>.

- Mitchell, Timothy. 1991. "The limits of the state: beyond statist approaches and their critics." *The American Political Science Review*. 85(1): 77–96. <https://doi.org/10.2307/1962879>.
- Mitchell, Timothy. 2002. *Rule of Experts: Egypt, Techno-Politics, Modernity*. University of California Press.
- Moir, William H. and William M. Block. 2001. "Adaptive management on public lands in the United States: commitment or rhetoric?" *Environmental Management*. 28(2): 141–148. <http://doi.org/10.1007/s002670010213>.
- Morgan, Kimberly J. and Ann Shola Orloff. (Eds.) 2017. *The Many Hands of the State: Theorizing Political Authority and Social Control*. Cambridge University Press.
- Murphy, Michelle. 2006. *Sick Building Syndrome and the Problem of Uncertainty: Environmental Politics, Technoscience, and Women Workers*. Duke University Press.
- Neumann, Roderick P. 1998. *Imposing Wilderness: Struggles over Livelihood and Nature Preservation in Africa*. University of California Press.
- O'Connell, John. 2015. "Biologist Changing Way Wolves Are Tracked." *Capital Press*, December 4, 2015, Accessed October 13, 2018. <http://www.capitalpress.com/Livestock/20151204/biologist-changing-way-wolves-are-tracked>.
- O'Neill, John. 2007. *Markets, Deliberation and Environment*. Routledge.
- Oreskes, Naomi and Erik M. Conway. 2010. *Merchants of Doubt: How a Handful of Scientists Obscured the Truth on Issues from Tobacco Smoke to Global Warming*. Bloomsbury.
- Our Public Lands. n.d. "Idaho." Our Public Lands. Accessed June 22, 2018. <http://www.ourpubliclands.org/public-lands-report-id>.
- Peluso, Nancy Lee. 1992. *Rich Forests, Poor People: Resource Control and Resistance in Java*. University of California Press.
- Peluso, Nancy Lee. 1993. "Coercing conservation?: the politics of state resource control." *Global Environmental Change*. 3(2): 199–217. [https://doi.org/10.1016/0959-3780\(93\)90006-7](https://doi.org/10.1016/0959-3780(93)90006-7).
- Perry, Somerset. 2012. "The gray wolf delisting rider and state management under the Endangered Species Act." *Ecology Law Quarterly*. 39(2): 439–473. <https://www.jstor.org/stable/44321181>.
- Picket, Steward T.A., V. Thomas Parker, and Peggy L. Fiedler. 1992. "The new paradigm in ecology: implications for conservation above the species level." In: Peggy L. Fiedler and Subodh K. Jain. (Eds.) *Conservation Biology: The Theory and Practice of Nature Conservation Preservation and Management*. Springer, pp. 65–88. https://doi.org/10.1007/978-1-4684-6426-9_4.
- Plato. 360. *The Republic*. The Internet Classics Archive. <http://classics.mit.edu/Plato/republic.7.vi.html>.
- Porter, Theodore M. 1995. *Trust in Numbers: The Pursuit of Objectivity in Science and Public Life*. Princeton University Press.
- Pred, Allan. 2007. "Situated ignorance and state terrorism: silences, W.M.D., collective amnesia, and the manufacture of fear." In: Derek Gregory and Allan Pred. (Eds.) *Violent Geographies: Fear, Terror, and Political Violence*. Routledge, pp. 363–384.
- Proctor, Robert N. and Londa Schiebinger. (Eds.) 2008. *Agnotology: The Making and Unmaking of Ignorance*. Stanford University Press.

- Rittel, Horst W. J. and Melvin M. Webber. 1973. "Dilemmas in a general theory of planning." *Policy Sciences*. 4(2): 155–169. <https://doi.org/10.1007/BF01405730>.
- Robertson, Morgan M. 2006. "The nature that capital can see: science, state, and market in the commodification of ecosystem services." *Environment and Planning D: Society and Space*. 24(3): 367–387. <https://doi.org/10.1068/d3304>.
- Rowley, William D. 1985. *U.S. Forest Service Grazing and Rangelands: A History*. Texas A&M University Press.
- Russell, Betsy Z. 2009. "Idaho's Wolf Hunt Is On." *The Spokesman-Review*, August 17, 2009, Accessed October 13, 2018. <http://www.spokesman.com/stories/2009/aug/17/idahos-wolf-hunt/>.
- Sayre, Nathan F. 2002. *Ranching, Endangered Species, and Urbanization in the Southwest: Species of Capital*. University of Arizona Press.
- Sayre, Nathan F. 2017. *The Politics of Scale: A History of Rangeland Science*. University of Chicago Press.
- Schreiber, E. Sabine G., Andrew R. Bearlin, Simon J. Nicol, and Charles R. Todd. 2004. "Adaptive management: a synthesis of current understanding and effective application." *Ecological Management & Restoration*. 5(3): 177–182. <https://doi.org/10.1111/j.1442-8903.2004.00206.x>.
- Scott, James C. 1998. *Seeing Like a State: How Certain Schemes to Improve the Human Condition Have Failed*. Yale University Press.
- Scott, James C. 2008. *Weapons of the Weak: Everyday Forms of Peasant Resistance*. Yale University Press.
- Sedell, Jennifer K. In press. "No fly zone? Spatializing regimes of perceptibility, uncertainty, and the ontological fight over quarantine pests in California." *Geoforum*. <https://doi.org/10.1016/j.geoforum.2019.04.008>.
- Simon, H. A. 1956. "Rational choice and the structure of the environment." *Psychological Review*. 63(2): 129–138. <https://doi.org/10.1037/h0042769>.
- Smith, Arthur H. and William E. Martin. 1972. "Socioeconomic behavior of cattle ranchers, with implications for rural community development in the West." *American Journal of Agricultural Economics*. 54(2): 217–225. <https://doi.org/10.2307/1238704>.
- Stansbury, Carisa R., David E. Ausband, Peter Zager, Curt M. Mack, Craig R. Miller, Matthew W. Pennell, and Lisette P. Waits. 2014. "A long-term population monitoring approach for a wide-ranging carnivore: noninvasive genetic sampling of gray wolf rendezvous sites in Idaho, USA." *Journal of Wildlife Management*. 78(6): 1040–1049. <https://doi.org/10.1002/jwmg.736>.
- Stenglein, Jennifer L., Lisette P. Waits, David E. Ausband, Peter Zager, and Curt M. Mack. 2010. "Efficient, noninvasive genetic sampling for monitoring reintroduced wolves." *Journal of Wildlife Management*. 74(5): 1050–1058. <https://doi.org/10.2193/2009-305>.
- Stone, Suzanne, Stewart W. Breck, Jesse Timberlake, Peter M. Haswell, Fernando Najera, Brian S. Bean, and Daniel J. Thornhill. 2017. Adaptive use of nonlethal strategies for minimizing wolf-sheep conflict in Idaho. *Journal of Mammalogy*. 98(1): 33–44. <https://doi.org/10.1093/jmammal/gyw188>.
- Suding, Katharine N., Katherine L. Gross, and Gregory R. Houseman. 2004. "Alternative states and positive feedbacks in restoration ecology." *Trends in Ecology & Evolution*. 19(1): 46–53. <https://doi.org/10.1016/j.tree.2003.10.005>.

- Tilly, Charles. 1999. "Survey article: Power—top down and bottom up." *The Journal of Political Philosophy*. 7(3): 330–352. <https://doi.org/10.1111/1467-9760.00080>.
- Treves, Adrian, and K. Ullas Karanth. 2003. "Human-carnivore conflict and perspectives on carnivore management worldwide." *Conservation Biology*. 17(6): 1491–1499. <https://doi.org/10.1111/j.1523-1739.2003.00059.x>.
- Treves, Adrian, Kyle A. Artelle, Chris T. Darimont, and David R. Parsons. 2017. "Mismeasured mortality: correcting estimates of wolf poaching in the United States." *Journal of Mammalogy*. 98(5): 1256–1264. <https://doi.org/10.1093/jmammal/gyx052>.
- U.S. Fish and Wildlife Service, 1987. *Northern Rocky Mountain Wolf Recovery Plan* (revised). USFWS, Rockville, MD.
- U.S. Fish and Wildlife Service, Nez Perce Tribe, National Park Service, and USDA Wildlife Services. 2000. "Rocky Mountain Wolf Recovery 1999 Annual Report." USFWS, Ecological Services, Helena, MT. <https://www.fws.gov/mountain-prairie/es/species/mammals/wolf/annualrpt99/>.
- U.S. Fish and Wildlife Service, Nez Perce Tribe, National Park Service, and USDA Wildlife Services. 2002. "Rocky Mountain Wolf Recovery 2001 Annual Report." T. Meier (Ed.), USFWS, Ecological Services, Helena, MT. <https://www.fws.gov/mountain-prairie/es/species/mammals/wolf/annualrpt01/2001report.pdf>.
- U.S. Fish and Wildlife Service, Nez Perce Tribe, National Park Service, and USDA Wildlife Services. 2003. "Rocky Mountain Wolf Recovery 2002 Annual Report." T. Meier (Ed.), USFWS, Ecological Services, Helena, MT. <https://www.fws.gov/mountain-prairie/es/species/mammals/wolf/annualrpt02/2002report.pdf>.
- U.S. Fish and Wildlife Service, Nez Perce Tribe, National Park Service, and USDA Wildlife Services. 2004. "Rocky Mountain Wolf Recovery 2003 Annual Report." T. Meier (Ed.), USFWS, Ecological Services, Helena, MT. <https://www.fws.gov/mountain-prairie/es/species/mammals/wolf/annualrpt03/2003report.pdf>.
- United States Forest Service. 2002. "The Process Predicament: How Statutory, Regulatory, and Administrative Factors Affect National Forest Management." Washington, DC: USDA Forest Service. Accessed October 13, 2018. <https://www.fs.fed.us/projects/documents/Process-Predicament.pdf>.
- United States Forest Service. 2012. "Land Areas of the National Forest System." FS-383. USDA Forest Service. Accessed October 13, 2018. https://www.fs.fed.us/land/staff/lar/LAR2011/LAR2011_Book_A5.pdf.
- United States Forest Service. 2017. "Improving Environmental Analysis and Decision Making." Managing the Land. Accessed October 13, 2018. <https://www.fs.fed.us/managing-land/cadm>.
- United States Forest Service. n.d. "Frank Church River of No Return Wilderness." Special Places. Accessed October 13, 2018. <https://www.fs.usda.gov/detail/scnf/specialplaces/?cid=stelprdb5360033>.
- Walker, Peter A. 2003. "Reconsidering 'regional' political ecologies: toward a political ecology of the rural American West." *Progress in Human Geography*. 7(1): 7–24. <https://doi.org/10.1191/0309132503ph410oa>.
- Walters, Carl J. 1986. *Adaptive Management of Renewable Resources*. Macmillan.

- Walters, Carl J. and C.S. Holling. 1990. "Large-scale management experiments and learning by doing." *Ecology*. 71(6): 2060–2068. <https://doi.org/10.2307/1938620>.
- Wuerthner, George and Mollie Yoneko Matteson. 2002. *Welfare Ranching: The Subsidized Destruction of the American West*. Island Press.